

Time, Cost , Productivity and Quality Analysis of Precast Buildings

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Abstract -The growth of Indian construction is going to accelerate to fulfill (meet) the need of future generation, time effective and achieving advance technique. The paper based on time , cost ,Quality And productivity analysis of precast Technique . Time , cost and productivity are dependent factors of each other as cost varies with time of construction and time varies with Productivity. For project having time constrain can executed with precast technology. Precast construction technique enhanced the quality of work, save time, reduced the cost of construction required for maintenance of work. In Precast factory, elements are manufactured (i.e. in controlled environment) with required quality, easily mix, and cure till achieved good quantity with desired strength. Precast concrete construction is considered to produce better productivity and reduce completion time, cost and dependency on work force. This paper reviews and summarizes the role of time, cost, quality and productivity of the precast technique.

Key-Words: Precast construction, construction management, time and cost analysis, quality and productivity.

1.INTRODUCTION

The development of the construction industry has been increased rapidly with the introduction of new system of construction and new technologies. Precast concrete technology is being used widely by many countries around the world, which is one of the most cost effective and quality monitored system. India is an infrastructure starved country. With the rise in technology, the construction boom in India is developing at a fast growth rate. It provides a wide spectrum for the introduction of precast concrete building systems to our construction methodology. Presently, fast track construction is a rapidly growing technique, and the time save in construction would compensate the overall construction cost, making prefab technology widely accepted all over India.

We have been working in Precast India Infrastructure Pvt. Ltd. Company , Pune as management trainee. In this study we have gone through precast Productivity , Quality , cost & time analysis of precast structure. We have also made comparison of both precast & Traditional cast in situ construction method on the basis

of selected case For Analysis we have considered following Factors

- Production cost
- Equipment used
- Material used
- Machinery needed
- Storage Area cost
- Labor cost
- Transportation Cost
- Efficiency of workers

2. METHODOLOGY

2.1 Literature review:

We have studied some research Paper , Books related to Precast technique.

2.2 Case Study :

To study the precast Technique we have been Working in Precast India Infrastructure Pvt. Ltd. at Pune for 6 month in Planning, purchase , quality department as management trainee. By Reviewing all Planning , Production Cycle , Quality Checks we have done analysis of Time , cost , Quality , Productivity.

2.3 Analysis:

In this work By Reviewing all Planning , Production Cycle , Quality Checks we have done analysis of Time , cost , Quality , Productivity. Also few advantages & Drawbacks of Precast Technique with respect to conventional RCC building are identified by us . For these analysis we have studied whole Production cycle starting from planning till erection at site.

From above Process we have come to the conclusion about the precast construction & related facts about execution & economic aspects. & detail conclusions have been drawn in the report.

3. COMPARIVE STUDY OF PRECAST TECHNIQUE AND CAST IN SITU CONSTRUCTION

The most important aspect of any building is concrete and its strength. There are different methods of

concreting like a conventional method called cast-in-situ method and the other is called precast concrete method. In cast-in-situ method, concrete is prepared on the site and in precast method, it is casted in a factory away from the site and is transported to the site for Installation.

3.1 Time Analysis:

Pune Metro Office Project Were taken for Time Analysis which has been constructed with Precast Elements i.e precast Box wall, V beam, Arches, Plinth wall etc. All elements are casted in Precast Factory and then transported to site.

The duration period for the completion of the project was categorized into three stages- sub-structure, super structure and finishing works. Where site cleaning, excavation & earthwork of sub structure took the same time for cast in situ but as footings are also being casted in precast, substructure, superstructure work will complete earlier than cast in situ.

Table 1: Total Duration of Prefabrication Construction

Sr No.	Description	Duration
1	Sub Structure- (Site Cleaning, Earthwork, Soil Filing)	15
2	Foundation	8
3	Super Structure-(Wall Panel, V beams, Plinth wall and roofing slabs)	30
4	Finishing Work- (Electrical,Plumbing, Painting, Tiling, and Windows)	35

Precast construction takes less time duration in finishing works when compared to cast-in-situ, because of the electrical piping work is fitted already in precast walls and slabs. The plastering work is no need for precast elements, which is good in appearance and finishing the super structure was finished quickly with precast, as the walls and slabs are manufactured off site and installed on site during the time of the project.

Infrastructural Projects such as Metro Projects are having time constrain and lack of land for production of elements at site precast element is best option for such projects.

Table 2 –Total duration for Conventional Construction

Sr No.	Description	Duration
1	Sub Structure- (Site Cleaning,Earthwork Soil Filing)	15
2	Foundation	21

3	Super Structure-(Column Lintels & Sunshade, Beams, Roof Slabs)	50
4	Finishing Work- (Electrical,Plumbing, Painting, Tiling, and Windows)	45

Thus the total duration for a single storey residential building with precast technology was 88 days while with the conventional method was 131 days

3.2 COST ANALYSIS

Precast is an ideal solution for constructing a residential building due to the production of similar types of elements repeatedly in bulk, thus reducing cost. Pre-cast concrete provides durability, flexibility and sound durability with cost efficiency. Maintenance cost is also less in precast system. Cost of precast may vary with the type and the size of construction. For a small project the cost of precast increases due to no production of elements in bulk. However, for bigger projects the cost may decrease Significantly

Cost of construction is less in large size Projects in precast as production is in bulk quantity so labour cost, steel, concrete wastage and also finishing item cost will be less as compare to cast in situ. But transportation cost may be higher depend on distance between precast factory to construction site.

3.3 PRODUCTIVITY ANALYSIS

The labour productivity of a structure through precast system is more than that of Cast-in-situ system. The time required to install structural components using precast is less compared to CIS method. The variability of the productivity in precast method is also small, which means that it has more consistent productivity values over a period. The loss of efficiency in precast method is less as a result of smaller work force at the precast construction sites is demonstrated.

The cost incurred in the project is affected by the labour efficiency. The baseline productivity for both the methods, the precast component unit rates and the correlation of the productivity factors to construction productivity were found out.

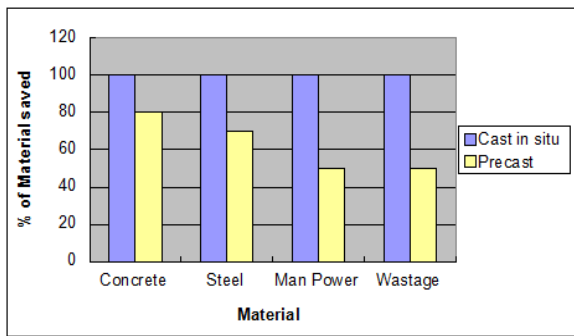


Fig. 1. Benefits of Precast

In the above figure the two different construction methods i.e. cast-in-situ and precast are compared and the benefits of precast are shown. It clearly depicts that precast uses 20% less concrete, 30% less steel, 50% less manpower, and 50% less wastage during construction.

3.4 QUALITY ANALYSIS:

Precision of detail, quality and uniformity of finishes, and uniformity of concrete properties (colour, density, compaction etc) may be assured in factory production to a degree not possible with site casting. Here it is not just precasting but factory conditions that are the issue. All of this is true if the element is standard manufactured, products subject to ongoing quality control its production. This is obviously of greatest concern for construction elements exposed to view, especially wall components.

In precast factory quality checking of each element is done at different stage. Each stage has a different check list. Only after quality supervisors approval after checking elements are promoted to next stage. Quality checking is starting from mould preparation till erection at site. In controlled environment at factory desired concrete properties can be achieved which may not be possible in case of cast in situ projects because of environment factors.

4. GENERAL COMPARISON OF PRECAST AND CAST IN SITU

Table 3 - Total duration for Conventional Construction

Particular	Precast	RCC
Construction speed	Very rapid speed of erection. Rapid construction on site.	Comparatively slow construction On site casting, so reinforcement laying & fixing, formwork.
Quality control	Good quality	Quality may affect

Environmental conditions	Weather is eliminated as a factor-you can cast in any weather and get the same results	due to site conditions, due to bad supervision, unskilled labor. Environmental conditions like temperature, humidity can affect on performance of concrete.
Labor Requirement	Less labor is required and that labor can be less skilled	More Labors required on site in case of RCC.
Manufacturing conditions	High quality can be achieved because of the controlled conditions in the factory.	RCC is to be casted on site & the site conditions are not regularized, so it may affect on strength.
Durability	Under controlled condition concrete is extremely durable	RCC is sufficiently durable but it requires proper quality control.
Size & Shape	Repeatability-it's easy to make many copies of the same precast product;	In-situ concreting is suitable where the building is in uneven shape & there are no repetitive shapes.
Connections	Connections are simpler	Connections may be difficult
Size Limitation	No limitation for size.	Because panel size is limited, precast concrete cannot be used for two-way structural systems.
Cost	It is comparatively economical when the building having no regular shapes.	Economics of scale demand regularly shaped buildings.

5 CONCLUSION

From all this study we can conclude that the

◆ precast concrete system is economical than conventional cast in place method but still there are some conditions which we have to take care of while using precast, those are quantity of construction, Distance of site from manufacturing unit. Type of building etc.

◆ we have identified that for standard & Repetitive work precast is the best option to choose. In observation the most important thing is to be observed project is in

precast construction technique is the time effective it require less time to construct.

◆ It requires skilled worker and qualified contractor, Lower initial cost especially for large project.

◆ We can achieve better concrete quality control and lighter concrete unite. T

◆ The main limitation of precast is transportation from place of manufacturing to place of site where it is to be fixed.

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